THE DIRECTOR'S REPORT

The Arnold Arboretum during the Fiscal Year ended June 30, 1956

By tradition the report of the Director of the Arnold Arboretum is published in the October issue of the Journal of the Arnold Arboretum and of late years has been distributed as well to the Friends of the Arnold Arboretum. The report, therefore, is written at the beginning of the summer, usually after the rush of activities of a busy spring. It is natural that the beauty of the Arboretum grounds during the past few months is foremost in the director's mind as one of the outstanding events of the past year. Spring was late in its arrival at the Arboretum in 1956 and the flowering season was characterized by one of the most unusual mixtures of flowering periods on record for Jamaica Plain. With forsythia and lilacs in nearly full bloom at the same time and with the lingering flowering of magnolias and normal flowering of various species of azalea there were many combinations of color and beauty never before recorded on our grounds. The grounds staff was able during the fall and winter to complete a backlog of pruning made necessary by the hurricanes of recent years, thus bringing the grounds to top condition. With the cooperation of the Boston Park Department in improving the appearance of the walks and roadways, one often heard the public comment, "The Arboretum has never looked as attractive as it does now."

The Staff:

The staff was saddened during the past year by the death of its Director *Emeritus*, Elmer Drew Merrill, on FEBRUARY 25, 1956. Dr. Merrill's long and active career in contribution to the knowledge of the Pacific area vegetation was reviewed in the July issue of the Journal of the Arnold Arboretum. His service to the Arboretum and to botany at Harvard was significant. With his appointment in 1936, he undertook to coordinate or combine, for greater efficiency and economy, the activities of nine separately endowed botanical organizations at Harvard. He was appointed the first "Administrator of Botanical Collections" and was supervisor of the Arnold Arboretum. Under his direction the Arboretum expanded its program of study in Asiatic vegetation and increased both its library and herbarium resources of this area. His own research interests in the Orient allowed him to guide with personal attention the exploration and collections of many young botanists. The outbreak of the second World War prevented the implementation of the plans Merrill had prepared for the union of botanical resources at Harvard and it was only after his retirement that his administrative ideas were carried out. The war effort, however, again demonstrated the practical value of the botanical information inherent in the herbarium collections and library necessary for the study of plants and

Merrill's several books on emergency food plants and the educational and recreational guides to the biology of the Pacific area drew just praise. Dr. Merrill retired as Director of the Arnold Arboretum in 1946 and as Arnold Professor of Botany in 1948, at the age of seventy-two. It was then that he received his first Guggenheim Fellowship, an award usually reserved for younger men, to make possible several trips to European herbaria and a continuation of his studies. Unfortunately, a series of heart attacks limited his activities and led ultimately to his death. Tributes and honors to Elmer Drew Merrill have been received at the Arnold Arboretum from many of the societies and fellowships to which he belonged. He was known around the world, as recent tributes from institutions as far separated as the Academy of Sciences of the Philippines from the Académie des Sciences in Paris will testify.

It is also with regret, but with appreciation for their services, that I announce the retirement and resignation during the fiscal year of Miss Hariklia Yeranian in July of 1955 and Mrs. Beatrix Farrand during the winter months. Miss Yeranian, a mounter of specimens at the Arnold Arboretum for thirty-two years, saw the development of the herbarium to its stature of today. Beatrix Farrand, noted horticulturist and long a friend of the Arnold Arboretum, was appointed consulting landscape architect in 1945 and contributed valuable services in the necessary revamping of the grounds following the unavoidable neglect of the war years. Through her vision the Arboretum has vistas, groupings and patterns of color for all to enjoy on the grounds.

Two botanists were added to the staff of the Arboretum during the past fiscal year to work on special projects supported wholly or in part by special grants. Dr. Robert Bennie Channell, who received his Doctor of Philosophy degree from Duke, joined the staff to work with Dr. Carroll Wood on the vegetation of the southeastern states. This work is supported in part by grants from the National Science Foundation and by the George R. Cooley Fund for work in taxonomy of flowering plants.

Dr. Ding Hou received his doctorate from Washington University in St. Louis, where he worked under Dr. Robert Woodson in preparing a revision of the genus *Celastrus*. Dr. Hou accepted a one-year appointment at the Arboretum to assist on the Flora of China project which has been supported by grants from the China International Foundation.

Honors came to several staff members during the year. Professor I. W. Bailey was elected a foreign member of the Linnaean Society of London and an honorary member of the Indian Botanical Society. Dr. Donald Wyman continued his services as a Trustee of the Massachusetts Horticultural Society and was elected secretary of the American Horticultural Council, succeeding in that office Dr. George Lawrence of the Bailey Hortorium. Dr. Howard was elected to serve a one-year term as one of the Directors of the American Association of Botanical Gardens and Arboretums. Dr. Kobuski was re-elected Assistant Curator of the herbarium of the New England Botanical Club and continued to serve on the council of that organization. Dr. Wood accepted the secretaryship of the Syste-

matic Section, Botanical Society of America in preparation for the meeting of the American Institute of Biological Sciences to be held in Storrs, Connecticut, in 1956.

Members of the staff, both officially and informally, represented the Arboretum at horticultural and botanical functions on both sides of the Atlantic during the past year. Dr. Howard attended the Fourteenth International Horticultural Congress held in the Netherlands. His visit to European gardens will be described later in this report. Dr. Sax and Dr. Wood attended annual meetings of the American Institute of Biological Sciences in East Lansing, Michigan, in September. Dr. Donald Wyman represented the Arboretum at meetings of the American Horticultural Council and the American Association of Botanical Gardens and Arboretums held jointly in Philadelphia. Mr. Coggeshall attended the meeting of the Plant Propagator's Society in Cleveland, where he presented a feature paper on the propagation of Asiatic maples. Dr. Karl Sax was chairman of the opening session of the Brookhaven National Laboratory Genetics Symposium and attended the American Society of Horticultural Sciences Conference on root-stocks held at Monmouth, Maine. He also presented papers at the Northeast Regional Meeting of the American Society of Horticultural Sciences held at the Biological Laboratories in Cambridge during the winter.

The requests for staff members of the Arboretum to speak for meetings of garden clubs and groups interested in the work and resources of the Arboretum and its staff continued to exceed our ability to fulfill. Such extension services must, of necessity, remain an extracurricular activity of the Arboretum staff members. Even so, staff members travelled widely and spoke to many groups on a wide variety of topics. Dr. Howard presented one of the Science Lectures in the winter lecture series at the Fairchild Tropical Garden in Miami, Florida, while en route to Jamaica for field work. On the same trip he spoke to garden clubs in Daytona Beach, Hobe Sound and West Palm Beach and to Harvard Clubs in Jacksonville, Winter Park, Miami and St. Petersburg in Florida and in Birmingham, Alabama. In addition to this schedule, he lectured to other groups in several of the New England States. Dr. Sax and Mr. Coggeshall each took part in the lecture series of the Massachusetts Horticultural Society in Boston. Mr. Coggeshall spoke for the Massachusetts Nurserymen's Short Course, for the Gardeners and Florists Club of Boston and also to the Rhode Island Nurserymen's Association. Dr. Wood described the activities of the Arboretum to Harvard Clubs in Massachusetts and in North Carolina and Dr. Wyman and Mr. Williams lectured on subjects of their specialty to garden clubs in several New England States. The Arboretum is fortunate in being so well represented by capable speakers.

Horticulture:

Again this past year the weather of New England has varied from that expected and so has been an important factor in the growth and maintenance of the plants at the Arboretum. During the summer sustained rainy

FIG. 1. Flooding in the Arnold Arboretum during the heavy summer rains, 1955. Both pictures taken on August 19th.

TOP: Bussey Brook looking towards Walter Street Gate with the water reaching the road.

BOTTOM: Flood waters in the Linden collection near the *Cercidiphyllum* across from the Meadow Road.

periods, especially those associated with hurricane "Diane," produced flooding in many parts of the grounds and caused the Bussey Brook to run high and wash out its retaining walls in several places. The floods themselves did not do serious damage but the saturation of the ground, with accompanying gusty winds, even though low in velocity, caused the loss of several trees which had been weakened in previous seasons by hurricanes. We notice especially the loss of a specimen white oak across from the collection of mountain laurels which leaned for many years towards Bussey Brook. It was under this tree that a memorial service for Charles Sargent was held in 1927. This magnificent oak, which withstood the severe hurricanes of 1938, 1953 and 1954, fell during an eleven-inch rainfall in the summer of 1955 and of course could not be re-established.

The high water table lasted into the fall and winter and the freezing and thawing of the early months of 1956 produced further standing water in parts of the Arboretum. The linden collection, located in a natural low spot along the Meadow Road, appears to have been affected by this standing water and several of the larger trees show signs of considerable damage. In addition, mould became prevalent in the turf of that area and required special treatment.

One of the latest freezes on record occurred on May 25th in Jamaica Plain and was also felt at Weston. This late freeze caused minor damage to the leaves and flowers normally open at that time, but, insofar as is known to the present, will have no lasting effects on the ornamental plantings in Jamaica Plain. The apple crop at Weston, however, is a total loss this year because of the freeze.

The destructive effects of the torrents of water which poured down Bussey Brook, crossing above the road at the rhododendron collections and washing out the retaining walls, have required special consideration. Several of the plantings in the rhododendron collection lost soil from around the roots. Erosion is also evident at the golden larch plantings. As the maintenance of such storm sewers is the responsibility of the Boston Park Department, this condition has been called to their attention and some work was started on replacing the retaining wall during June.

The appearance of the grounds, particularly near the lilac collection, was greatly enhanced this year when the Park Department found it possible to clean out the grass and soil from a portion of the cobblestone gutters which line the roads. This task has been neglected since before the War. The accumulation of silt and the encroachment of grass and weeds made maintenance of the collections difficult, thus detracting from the appearance of the grounds. The workers of the Park Department started at the collection of viburnums and cleared down to the forsythias. The Arboretum crew continued the work to the Forest Hills Gate and also edged all the sidewalks from the Forest Hills Gate to above the lilacs. The Park Department also repaired the macadam sidewalks, improving the appearance and increasing the safety of these paths. Again, neglect and lack of care in recent years had created unsightliness and hazard in the tussock growth of grass in the sidewalk areas.

FIG. 2. The Sargent cherry near the pond at the Forest Hills Gate was badly broken during the hurricanes of 1954 and had to be removed. A large specimen was moved by the Arboretum staff to a more favorable spot on the edge of the same pond.

Special attention has been given to the plantings at the summit of Bussey Hill. Many of these shrub plantings had become overgrown and filled with weed trees. The valueless plants were weeded out of these areas and many of the approaches to the turn-around area were planted in ground covers which will improve the appearance of the area and at the same time demonstrate many of the better ground covers in natural settings, to contrast with the comparative row plantings of Weston.

The collection of rhododendrons has responded so well to the applications of fertilizer and, in particular, to castor pumice applied in the past two years, that additional supplies of this fertilizer were added to the mountain laurel collection and to various plantings of azaleas. The collection of *Rhododendron calendulaceum* bloomed especially well this year, indicating that the treatments given have been correct. The overgrown collection of Ghent hybrid azaleas also received special attention during the fall. The resulting bloom in the spring was spectacular. Both of these collections were outstanding in their excellent natural setting among the oaks.

During the last year the Arboretum was troubled with a severe infestation of rhododendron scale which resisted control with the usual sprays and methods of application. This scale was tentatively identified as one of the Kermes scales which invades the crevices of the bark. The mature scales are extremely difficult to kill. It was recognized that an attack on the hatching scales would be the only satisfactory method of control. Applications of two pounds of 50% wettable DDT and two pounds of 25% malathion wettable powder in 100 gallons of water were made with a power sprayer to allow the spray to run down all the branches and twigs. Applications made on June 20, July 8 and August 1 seemed to give almost complete control of this pernicious pest. The only other disease of consequence in the Arboretum has been the outbreak of fire blight on crab apples and other members of the Rosaceae, but control by the new antibiotics appears to be effective, although expensive at the present time. During the year applications of milky spore disease, under the trade name of "Doom" were made to the lawns and grassy areas within the Arboretum. It is hoped that this attack on the Japanese beetles will reduce their numbers within a few years. In the meantime, spraying with insecticide was continued to counter the ravages of these insects, primarily on members of the Rosaceae.

Among the items of equipment purchased in the fiscal year were a mechanized rotary soil screen to make possible the use of street sweepings and leaves deposited in our dump by the Street Department of the City of Boston. A double disc was purchased to facilitate cultivation in the shrub collection. A new two-ton Chevrolet truck with a dump body and a winch was a needed item to replace an old Army truck purchased in 1948 from Army surplus. A new type of lawn mower with a rotary blade called a "Snappin' Turtle" was obtained to replace the reel-type mower used along the walks and in the shrub and lilac collections. The new machine not only has a reverse drive, making it easier to handle, but will cut taller grass than our older machine.

Two hundred and twenty species and varieties were added to the collec-

tions in a fall and spring planting program. Of these, seventeen appear to be completely new to American gardens and forty-nine additional ones have never been tried at the Arnold Arboretum. The remainder, in some cases, duplicate plants already in our collections, but represent additional clones for trial, while others represent taxa which have been grown at the Arboretum in the past but have died out or have been lost.

Dr. Wyman continued to act as coordinator for a group of American arboreta and botanic gardens by working in conjunction with the Horticultural Crops Research Branch of the U.S. Department of Agriculture in bringing into the United States for trial plants now on the "prohibited list." One hundred and forty-five plants have been introduced and grown for two years at Glen Dale, Maryland, to satisfy the Bureau of Plant Quarantine Regulations. They have now been released to interested arboreta for propagation and distribution. Fifteen taxa were released for the first time this year.

Four plants were propagated and offered for distribution to nurserymen in continuation of the Arboretum's program of making the best ornamental plants available for commercial distribution. Thirty-six nurserymen in the United States, Canada, England and the Netherlands accepted plants under the terms of agreement to propagate from the plants supplied. The origins of the four plants, *Magnolia loebneri* cv. "Merrill," *Crataegus monogyna* var. *inermis*, *Pyracantha coccinea* cv. "Kazan" and *Cornus alba* var. *sibirica*, are of interest. *Magnolia loebneri* is a hybrid species known in Europe since its first production around 1885. The best features of the two parents, *Magnolia stellata* and *M. kobus*, appeared in the hybrid. Unfortunately, the hybrids introduced into the United States did not prove desirable or hardy in the Boston area. The same parents were crossed by Dr. Sax at the Arboretum in 1935 and the most desirable selection from this cross was given the cultivar name honoring Dr. Elmer Merrill. *Magnolia loebneri* cv. "Merrill," therefore, is a new selection of a cross which has long been known. Of a different origin is *Crataegus monogyna* var. *inermis*, an excellent but little known thorn-apple which has been under cultivation at the Arboretum since 1914. The staff felt that this plant should be better known; hence its selection for distribution to cooperating nurserymen. The remaining two plants offered, *Pyracantha coccinea* cv. "Kazan" and *Cornus alba* var. *sibirica* are recent introductions of the Arnold Arboretum from Europe. It is felt that the former, although still under trial, will prove to be more hardy than any other fire thorn. The latter was selected as true to type, for many inferior plants, incorrectly named, are being grown under this name throughout the country. This stock distributed by the Arboretum will assure nurserymen of a re-established standard plant, accurately determined.

In addition to plants which were sent to cooperating nurserymen, the Arboretum has filled many requests for plant materials and plant parts from literally all sections of the world. Requests for materials from the living collections varied from pollen for identification and breeding programs to seeds and propagating material to herbarium specimens and pre-

served or fresh material for scientific study. These requests are filled as time and personnel permit. During the past fiscal year the propagator distributed on request ninety-four shipments of seeds representing three hundred and twenty-two species and varieties. These were sent to eleven countries besides the United States and Canada. In addition, one hundred and fifty-one shipments of four hundred fifty-six species and varieties of whole plants or cuttings and similar parts for propagation were sent to four different countries outside of the United States. Such shipments involve time and often considerable routine labor for preparation and may also be expensive when shipments must be sent by air to insure the materials of safe arrival in living condition. Many of the shipments are offered in exchange and many other gardens and arboreta ship, with or without warning, plants or seeds for trial plantings. Thus, during the past year the Arboretum received both by request and without requests one hundred forty shipments of plant parts, representing five hundred sixteen species and varieties.

During the past year it has been possible to establish a working procedure with several gardens and arboreta in the Southeastern United States and in the Caribbean. Now, when seed shipments are received, sizeable quantities are divided and portions of the seed-lot are shipped to more southern institutions for trial. If seed-lots are small, the plants are started in our greenhouses and the quantity of young plants are divided, a portion to be tried for hardiness in our own area and others to be sent for trial further south. We hope by this method to carry through to maturity many of the species and varieties sent to us for trial which in the past have been frequently lost when the young plants were killed by severe winters. At the same time the chance of a hardy strain surviving the New England climate has not been eliminated.

For our own collections, for distribution and for experimental purposes, the propagator increased by cuttings, grafts and budding 15,516 individual plants, representing four hundred seventy-five species and varieties. As the plants propagated were often in excess of our own needs, many were distributed informally for testing purposes through the educational program. In addition, when circumstances permit, the Arboretum will cooperate with outside organizations for worthwhile purposes. Specimen trees were made available for public plantings at several New England libraries during the past year and in response to a special request the Arboretum was pleased to cooperate with the Boston Art Festival Committee. This Committee wished to make a gift of a tree to the City of Boston for the Boston Public Garden. The director felt that the Public Garden should have the most recent "living fossil," *Metasequoia glyptostroboides,* a plant introduced by the Arnold Arboretum, to complement and accompany the older "living fossils," *Ginkgo biloba*, which are present in the Garden. A large tree of the original introduction fortunately was still available in a nursery plot at Weston. The tree was fourteen feet tall, too large for the Arboretum staff to handle; hence it was moved by a professional arborist at his own expense, during the festival. In spite of the

dry weather and the out-of-season transplanting, our latest observation indicates the operation to be a complete success and the tree is growing well in its new location.

Many of the surplus plants grown at the Arboretum find a place on the grounds around the Harvard University Buildings in Cambridge. Surplus shrubs ranging from three to eight feet high and trees six to ten feet high were selected by the Department of Buildings and Grounds from a list of ninety-two species which we felt were desirable for campus plantings. This distribution of surplus plants was mentioned in the original indenture establishing the Arnold Arboretum. Such plantings not only beautify the Harvard campus, but increase the student interest in horticulture and the proper selection of plant materials for landscape and garden design.

We continued a program of renovation of buildings belonging to the Arboretum in Jamaica Plain and Weston. During the year the Administration Building required repairs to the heating system and received new downspouts of heavy copper, as well as a complete outside painting of all exposed wood surfaces. The new rainspouts were badly needed.

The regular work of labelling and mapping the grounds and the checking of records continued throughout the year. Special characteristics of the plants or unusual responses are noted on the records in the master file. Additional photographs were taken of the grounds, the operations and the plants. These consisted of negatives and prints in monochrome and transparencies in thirty-five millimeter kodachrome and larger ektachrome. Photographs and prints are made available on request and are used in publications by the staff, as in Dr. Wyman's recent book on ground covers. The color transparencies have been reproduced in several national horticultural magazines and several were the bases for the drawings of ornamental shrubs and trees which appeared in Life magazine during the past year. The large sign sponsored by the Boston Envelope Company honoring the Arboretum was based on kodachrome slides in our files.

During the year Dr. Wyman was elected secretary of the American Horticultural Council and as a result the Arnold Arboretum has become the official headquarters and letterhead address for this organization. Dr. Wyman was able to complete and ready for publication his book, Ground Cover Plants.

The Fourteenth International Horticultural Congress was held in Scheveningen, the Netherlands, during August of 1956. Dr. Howard, who attended as representative of the Arnold Arboretum, was also able to visit many other botanical gardens and arboreta in Europe. His trip included visits to the Botanic Garden of the Riksmuseum in Stockholm and the old gardens at Charlottenlund in Sweden. In Denmark he visited the herbarium and the botanic garden, as well as the University gardens in Copenhagen, and made a special trip to northern Denmark to see the private botanic garden of the late Dr. Borgesen and to study some of the government forests in the area. Travelling by airliner made it possible for Dr. Howard to make short visits to the botanic gardens in Hamburg, Berlin, Hanover, Göttingen and Munich in Germany. After arriving in Zürich and visiting the

botanic garden of the University, Dr. Howard was invited to accompany Dr. Däniker, the director of the garden, on a trip across the Alps to Lake Maggiore and the newly-established botanic garden on the island of Brissago. This island garden, a short boat ride from Lucarno, features tropical and subtropical vegetation within sight of snow-capped mountains and glacial streams. His trip continued across northern Italy and across the Alps, this time by train, down the Rhone valley to Lucerne and Geneva, where he visited the botanic gardens in order to study the formal plantings so well done by the Department of Parks in the city of Geneva.

FIG. 3. The first general assembly of the Fourteenth International Horticultural Congress held at Scheveningen, the Netherlands, August 1955. Dr. Howard represented the Arboretum at these meetings.

The Horticultural Congress was held at the sea-side village of Scheveningen, just outside the Hague, which serves as headquarters for many international congresses. Excursions and visits were arranged before and during the Congress for the many visitors from abroad. Delegates and members attending the Congress far exceeded expectations and taxed the limited housing facilities to the utmost. However, the hosts met the situation and conducted an enjoyable and extremely well-executed Congress. Dr. Howard attended the pre-congress sessions of the Committee on Horticultural Nomenclature and Registration and, along with Dr. George Lawrence of the Bailey Hortorium, shared the distinction of being the only American horticulturists in these important sessions. The Committee

was unable to complete its discussions before the Congress convened and therefore held evening meetings during the scheduled program. Dr. Howard served on the subcommittee appointed by the chairman to draw up the resolutions for the Congress as a whole and he also agreed to serve on behalf of the Arnold Arboretum in an effort to compile a directory of privately maintained systematic listings of cultivar names and to report on such a list at the next Congress.

Excursions during the Congress took members to various parts of the Netherlands. Visits to the old arboretum at Boskoop, to Belmonte, the new arboretum, and to the commercial nurseries in the area proved most interesting. Comparisons in size of the collections at the new arboretum made by its director with the collections of the Arnold Arboretum proved embarrassing, as well as amusing. The removal of Dr. Sargent's collection of *Crataegus* from the slopes of Peter's Hill in Jamaica Plain was not known to the director of the Dutch Arboretum. It was a surprise to him to learn that his little Arboretum now contains more species and varieties of both *Crataegus* and *Sorbus* than does the Arnold Arboretum. Exchange of plant materials between gardens and nurseries in the Netherlands and the Arnold Arboretum have been many and frequent in the past and, with an appreciation of the resources of each area, will continue so in the future.

A high point of the Congress came near the close when the entire membership was taken to Amsterdam to attend the Alsmeer flower parade held in the Olympic stadium. This show, based on a theme of sound and color, with floral floats interpreting classic works of music, lasted three hours and was followed by a boat ride through the canals of Amsterdam.

The Congress offered the director an opportunity of meeting many horticulturists from remote sections of the world for the first time and of renewing acquaintances with others. After the close of these meetings Dr. Howard visited London, spending some time at Wisley and Kew and then travelled to Edinburgh to take part in the meeting of the Systematics Society of Scotland held at the Edinburgh Botanic Garden.

The trip was pleasant and profitable. It was obvious that American gardens such as the Arnold Arboretum can never compete in appearance with European gardens where meticulous hand labor is more available and more reasonably priced. The schools for gardening apprentices and students which supply much reasonable labor would not be feasible at the Arboretum. Also obvious was the difference in the consideration of the general public for the plants and plantings generally seen in Europe in contrast to our own experience in New England. Nevertheless, the Arnold Arboretum can be proud of the scope of its collections, the quality of the plants and especially the standards of labelling and accuracy of names in the living collections. In these characteristics, few European gardens even approach the Arnold Arboretum and none equals it.

The experimental work of the Arboretum staff dealing with ornamental plants on the grounds and in the greenhouses continued. Experimental and comparative methods of weed and brush control are always possible and, in fact, necessary to maintain the plantings. Special attention was again given

to control methods for *Cynanchum nigrum* and species of *Convolvulus*. Dr. Wood has under observation selected clones of *Robinia*, the rose acacia, both for basic information of the species relationships of the clones and for their possible ornamental value as individuals and as breeding stock. In the greenhouses Mr. Coggeshall continued his experiments on control of germination of seeds, propagation by cuttings, comparability of stock and scion and evaluation of propagation techniques. The intermittent mist propagation system given to the Arboretum for experimental purposes last year has been established and used for comparative propagation experiments with the plastic "tent" technique and other selected methods. Seeds of *Cotoneaster, Viburnum, Chionanthus* and *Hamamelis* have been subjected to tests designed to overcome double dormancy through the use of concentrated sulfuric acid. Seeds of *Laburnum* and *Albizzia* have received treatment with hot water and concentrated sulfuric acid to determine comparative effects of these treatments in germination. A number of *Rhododendron fortunei* hybrids of known rooting capability have been used to test the effects of types of media and wounding practices on the rooting of cuttings. An evaluation has been attempted of a new method of propagation using sphagnum moss and plastic by comparison experiments. Experiments of the compatibility of understocks and the treatments necessary in making successful grafts have been conducted with *Pinus* and *Picea* species. After one run was completed a letter was received from Australia asking for exactly the information which that experiment was designed to test. Thus by coincidence the Arboretum was able to supply new experimental data. A number of experiments are in progress to determine the effects which different temperatures, maintained for differing lengths of time, have upon the germination of such tree seeds as *Acer, Carpinus, Quercus, Magnolia, Cornus* and *Pseudolarix*. Many of the experiments mentioned are designed to provide the answer to problems long facing the Arboretum and the commercial nurserymen. Other experiments are designed to supply more scientific answers as to why plant materials must be handled as they are to respond as desired.

Finally, mention should be made of a development which will affect both the appearance and the problems of maintenance of the Arnold Arboretum in the future. During the year the City of Boston sold the land known as Joyce Kilmer Park, which is at the junction of Walter and Center Streets. This was deeded directly to the City of Boston and has never been a part of the Arboretum. This piece of wooded land is across from the conifer collection on Walter Street and adjoins the Weld-Walter Street tract of the Arboretum. The Park was sold to the trustees of the Dorchester Home for the Aged and, although the sale was protested by residents of the area, the sale was approved by the Supreme Judicial Court of Massachusetts. The trustees plan to erect on this site a large building tentatively known as the Hebrew Home for the Aged in West Roxbury. The large building will occupy most of the space available in the plot. As construction proceeds in the next year the traffic problem will be accentuated and when completed the service traffic and visitors to the Home will present additional

problems to be faced by the Arboretum staff. It is hoped that this building and its surrounding area can be landscaped so that it does not clash with the natural beauty of the adjacent Arboretum property. The Director of the Arboretum plans to remain in touch with the contractors and the trustees to work out mutual problems which will arise due to this significant change along Centre Street.

The Case Estates:

The horticultural work of the Case Estates in Weston continued without interruption during the year. Damage from floods, windstorms and frost was minor, excepting only the loss of the experimental apple crop due to a late May frost during the flowering period. Several of the buildings on the grounds were given additional attention during the year and one large house and adjacent land, left for the use of Mrs. Theodore Chandler by the will of Miss Marion Roby Case, reverted to the Arboretum when vacated by Mrs. Chandler in February of 1956. With the approval of the Corporation, this house is currently being renovated and will be occupied by the Director of the Arboretum in the fall.

The spring season was very slow in developing at Weston and the open house scheduled on the grounds for May 5th did not show the plants and plantings to the same advantage as did the comparable date of the year before. However, with excellent publicity, including location maps and directions published in the Sunday papers, the attendance was high despite inclement weather. Special attention was called by the newspapers and by an issue of Arnoldia to the collection of street trees and other small ornamental trees which have been established now for five years. This collection is located to the rear of the ground cover plots along the road to the town swimming pool and draws nearly as many visitors annually as does the better known ground cover display plot.

Some display planting of crab apples was done in the open field across from the Weston High School and one new area near the barn was developed for the collection of *Robinia* clones under study by Dr. Wood.

Education Program:

The informal education program of classes for adults held at the Arboretum was continued in two semester sessions during the past year. The interest in these courses remained high and the classes probably have the highest perfect attendance ratio of any education program in Boston.

During the fall the following classes were offered by Arboretum staff members: Basic Botany for the Home Gardener, Dr. Wood; Fall Field Class, Dr. Wyman; Plant Propagation I, Mr. Coggeshall; and Principles and Practice of Plant Identification, Dr. Howard. Mr. Coggeshall's classes in plant propagation proved so popular that three sessions were offered again. The subject matter was divided between fall and spring so that topics for practice and immediate use could be taught at the appropriate time. Dr. Howard's class was new to the program and was designed to familiarize students with the use of keys, manuals and descriptions of

cultivated plants and to recognize the larger groups of cultivated plants by the morphological characters that define and distinguish them.

Two new classes were added to the spring program of education classes. Mr. Albert C. Burrage, well known to New England horticulturists for his work with economic horticulture of garden vegetables, offered a delightfully informative course in Gardening with Vegetables. The course was highlighted by the instructor's pleasing personality as well as by his prejudices not only for good vegetables but for proper methods of preparation for the table. The course succeeded in tempting the palate as well as the mind. Dr. Karl Sax, of the Arboretum staff, offered a class in Plant Breeding which devoted several evening sessions to the genetic and morphological principles behind the practice of plant breeding and concluded with class meetings on the grounds where crosses were made of standard parentages and several others experimental in nature.

Mr. Coggeshall continued his classes in plant propagation with the second part of the course in the spring. Dr. Howard continued his class in plant identification as an advanced session working with the same group in field practice in late afternoon and evening sessions on the grounds of the Arboretum. A fifth class was Dr. Wyman's ever-popular spring field class, which was well attended.

In addition to the formal classes described, the staff joined in other types of instruction. During the spring, guided tours of the grounds were offered to any group bringing a minimum of twenty-five persons and scheduling the trip in advance. Garden clubs in particular are familiar with this service and use these trips as programs and sources of information. Few such trips end without a concentrated question-session.

The staff also cooperated with the Massachusetts Horticultural Society in presenting their annual Field Day at the Arnold Arboretum on Saturday, May 19th. Postcards to all members of the Horticultural Society announced the morning session which would consist of guided tours in sightseeing buses equipped with amplifiers to aid the guide in presenting his talk. The attendance was more than expected and the four buses were filled before the scheduled departure time, requiring additional guides for those who had to tour the grounds in their own cars.

This week would normally have seen the lilac collection at its peak and an open house on the Arboretum grounds was scheduled for the following Sunday, May 20th. However, the flowering season was delayed and crab apples, forsythia, magnolias and miscellaneous shrubs supplied the bloom then deficient in the lilacs. Staff members were stationed at strategic places throughout the Arboretum to give directions and to answer questions. It is of interest to note that on the afternoon of the open house the periphery of the Arboretum was completely outlined with parked cars.

Among the groups of visitors to the Arboretum was a study group of horticulturists and nurserymen from Europe. This group of well-known students of ornamental plants included seventeen Germans, one Austrian and one Swiss, with an American specialist as guide and interpreter. The staff was pleased to have these men visit the collections in Jamaica Plain

and regretted only that the close scheduling of their trip made their visit here of short duration.

One of the highlights of the year was the venture of the Arboretum staff into education by television. During the slack summer months the staff was invited to present a series of experimental programs on WGBH-TV Channel 2. The time was selected so that it did not conflict with important network shows and so that the staff of the television station could work closely with the novices in this field from the Arboretum staff. During July and August the Arnold Arboretum presented four weekly hour-long programs entitled "Notes from the Arnold Arboretum," prepared and presented by Mr. Coggeshall, Dr. Howard, Dr. Wood and Dr. Wyman. The staff was in agreement as to the excellence of the medium for presenting information about plants and the fine cooperation received from the studio technicians. However, each program required such a major effort in preparation that with the regular work program before the staff we reluctantly decided against further regular programs. Mr. Coggeshall, Dr. Wyman and Dr. Howard appeared, however, on feature programs or as guests on other programs such as "Discovery" and "Within Your Reach" during the winter and spring seasons. The staff individually and collectively received commendation for the programs and in turn extended their thanks to the cameramen and directors who presented plants in close-ups on television screens to the satisfaction and delight of all. The staff attempts to cooperate as fully as possible with the educational television station and kodachrome slides from the Arboretum collection appear regularly as background scenes for programs, while specimens and plant materials from the Arboretum collections have illustrated many other television programs.

Exhibits and Displays:

For the past several years the Arnold Arboretum has had an exhibit at the spring flower show of the Massachusetts Horticultural Society. During the past year considerable time and effort went into the preparation of an exhibit demonstrating methods of increasing plants. The exhibit on plant propagation covering 1200 square feet of floor space and developed under the direction of Dr. Wyman, Mr. Coggeshall, Mr. Williams and Mr. Howard, was an outstanding exhibit, which again won for the Arboretum a First Prize and a Gold Medal. One of the material aids the Arboretum received in preparing this exhibit was the use of a lean-to type of greenhouse lent through the courtesy of the New England Greenhouse Company, Inc., of Hanover, Massachusetts.

In the exhibit room at the Administration Building in Jamaica Plain the staff offered the annual show of Christmas plants and Christmas greens. In addition to the more common evergreens, the show displayed a collection of dried plant materials bought in advance from the florist markets in Boston. The correct botanical determination of these plants and some information about them was supplied on labels. An outstanding feature of the exhibit, however, was the wreaths and decorations made of dried fruits

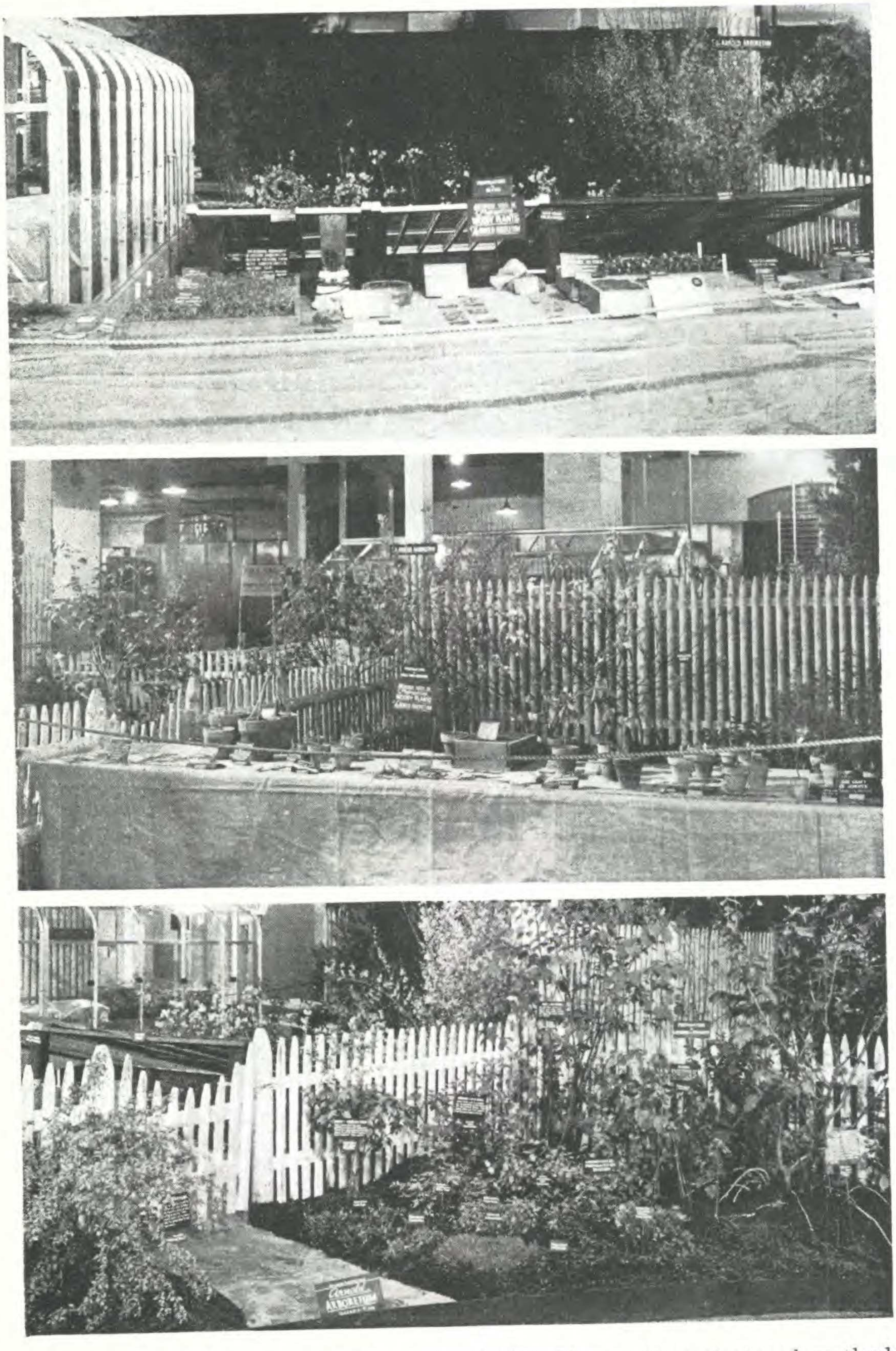

FIG. 4. The Arboretum exhibit at the Spring Flower Show featured methods and materials for plant propagation. Designed and executed by Dr. Wyman, Mr. Coggeshall and Mr. Williams, the exhibit won a first prize and a gold medal.

FIG. 5. The Arboretum proudly acknowledges the salute of the Boston Envelope Company through this colorful reproduction of the Forest Hills Gate and the background plantings of cherries. This billboard along U.S. Highway No. 1 has brought many visitors and inquiries to the Arnold Arboretum.

and cones by Mrs. Donald Wyman. It is hoped to utilize the experience and materials of this portion of the exhibit in an issue of Arnoldia for the next Christmas season. A Christmas tree decorated with horticultural ornaments served as the focal point of this seasonal exhibit.

The open houses held at the Case Estates and at Jamaica Plain have been referred to elsewhere. As part of the Commencement Week activities, the staff held open house for members of the twenty-fifth reunion class in scheduling tours and demonstrations in the Harvard University Herbarium in Cambridge.

During the spring the Arboretum was honored with a colorful billboard display along U.S. Route 1. On a sign sponsored by the Boston Envelope Company and under the title, "The Boston Envelope Company salutes the Arnold Arboretum, America's Greatest Garden," there appeared a colorful reproduction of the Forest Hills Gate and the cherry and apple collections inside. As the sign is located at the junction of the Jamaicaway and Brookline Avenue and is illuminated at night, it drew many phone calls and sent additional visitors to the grounds this spring.

Library:

The librarian, Mrs. Lazella Schwarten, and her staff of regular and temporary help were active during the year in the organization and integration of the books housed in the Harvard University Herbarium Building. Work was divided between much-needed physical care of the bindings, changes in cataloguing and actual integration and was carried on in addition to regular services to staff, students and visitors. The air-conditioned and filtered environment has made easier the care of the library volumes. Thus bindings treated or replaced during the year show better retention of quality than ever before.

The integration and cataloguing work of the year concerned primarily the volumes of periodicals. Individual volumes and sets were compared and selected on the basis of condition, origin as gifts or autographed copies, as well as for annotations and usefulness. Complete active sets are now maintained and the duplicates are being held in reserve. The final selection of sets for current use required changes in cataloguing and listings on the volumes and in the main catalogue, the shelf-list cards and the Kardex guide. Lists are also maintained of the reserve volumes. The majority of periodicals are now shelved in one section of the stacks and as work proceeds on the monograph collections and some further shifting is done, the remaining periodicals will be placed in a planned sequence.

With the completion of work on the periodicals, efforts were directed to an examination of the monograph collection. It is planned to integrate and consolidate this collection from the Gray Herbarium and the Arnold Arboretum and the duplicates are to be shelved in the herbarium adjacent to the appropriate family. The monographs will be numbered according to the Dalla Torre and Harms system of Genera Siphonogarum with the Arnold Arboretum supplementary listings and the authors' numbers according to Cutter. This task was about seventy percent complete at the end of the fiscal year.

Changes were made in the section shelving of horticultural books housed in the Administration Building in Jamaica Plain. Portions of the library were shifted to the second floor along with the back numbers of periodicals to allow room for expansion in the main library room. The system of arrangement was changed, involving a complete shift of nearly all books in the library, but resulting in a more workable organization for those visitors not thoroughly familiar with the scientific classification of categories of books.

During the year three hundred books were added to the library, including forty-three specially selected books to complement the horticultural holdings. The total accessioned bound volumes is now 49,509. Pamphlets received and added to the library total two hundred eighteen numbers, making a grand total of 15,968. Five hundred catalogue cards were added to the main file, eight hundred shelf cards were prepared and one thousand cards were added to the Gray Herbarium species index.

Requests for books on inter-library loan continued high, numbering one

hundred thirty-six individual shipments during the year to all parts of the country. The librarian continues to assist where possible in supplying photocopies or microfilm reproductions. If the request is reasonable, the librarian often checks a reference or verifies a page or date in preference to sending a book on loan. Such services characterize and are a credit to our librarian.

During the year Mrs. Schwarten compiled six numbers of the Index to American Botanical Literature which is published in the Bulletin of the Torrey Botanical Club.

Dr. Frans Verdoorn, Research associate, gave most of his time to the preparation of a bibliographic guide to biohistory (the historical and other humanistic aspects of biology and medicine) with some special reference to botany and horticulture. Work on his biographical card index of plant scientists (Index Botanicorum), as well as the gathering of data for his annotated bibliographies on the history of botanic gardens and the Linnaean period was continued along the same lines as during previous years.

Herbarium:

The plans described in previous reports for the integration of the herbarium collections moved to Cambridge and housed in the Harvard University Herbarium were the basis for the work of most of the herbarium staff during the past year. The curator, Dr. Kobuski, directed the progress of the integration and by the end of the year considerable and very satisfactory progress had been made in placing the combined herbaria in first-class condition. During the past year the families of plants represented in the collections of the Gray Herbarium and the Arnold Arboretum which were in proximate arrangement received further adjustments. Two major steps are involved in the handling of each family. In the first step the component genera are placed in sequence and in the second step actual integration at the species or sub-species level is accomplished. Each of these moves may involve considerable work, but in small families both steps can often be accomplished in one operation. Old genus covers are replaced. New generic boards are prepared. Type or authentic specimens are separated. In large families such as the Leguminosae and Rosaceae, even the first step can be complicated and time-consuming. When both the Gray Herbarium and the Arnold Arboretum followed the same generic order and divisions, the task was mainly a physical one of shifting several thousand compartments of specimens. Where different generic order was used or where different generic concepts were recognized, the consistent organization of genera in successive order required careful planning and execution. The decisions to recognize segregate genera or where to place in sequence recently described genera were made after staff consultation so that all staff members taking part in the move were aware of the location and the treatments to be followed. A test case involved the family Verbenaceae, where all available staff members of both institutions, twelve in number, worked on one family at the same time to do complete integration. More

recent practice has been to work in teams of two individuals on the generic integration and as individuals on the species integration. Two workers, therefore, were able to shift and rearrange the genera of the Leguminosae with little confusion and little wasted effort after the initial decisions of generic limits were made and the work planned.

Integration within the genus involves the arrangement of species and subspecific units, the writing of new covers, the geographic arrangement and segregations and the selection and separation of type material. Type or authentic specimens are being placed at the end of the genus or generic geographic unit; e.g., Am. Bor., Ind. Occ., etc., and indication that the type has been removed is made in the species arrangement. Types are being placed in individual species folders for the first time.

Unidentified materials in the herbaria are placed where possible with the genus and the proper geographic unit. Material identified only to family is sorted geographically and filed at the end of the family. The arrangement of geographic areas for the Eastern Hemisphere is that followed by the Arnold Arboretum herbarium and the arrangement for areas of the Western Hemisphere (and particularly the United States) is that used by the Gray Herbarium. At the end of the year the rearrangement of over one hundred families was under way or was completed.

The fruit and seed collection and the photograph and negative collection received additional work during the year. Two college students were employed during the summer to continue the task of arranging the negatives and prints of the type and authentic specimens represented in our herbarium or photographed by staff members elsewhere. The fruit and seed collections were placed in boxes, rather than bottles, and are to be arranged in a system comparable to that used in the herbarium. The boxes of specimens will be stored in special trays and units on the first floor of the building where these collections will be equally available for use by the taxonomists of living plants and the students of the fossil seeds and fruits of paleobotany.

Work on the herbarium of cultivated plants has been limited to checking the coverage of the herbarium in relation to Rehder's Manual and other handbooks of cultivated plants and to mark and separate types of cultivated taxa and cultivars.

During the past year 6060 specimens were mounted and added to the herbarium, bringing the total accession count to 687,807 specimens in the Arnold Arboretum.

The herbarium of the Arnold Arboretum received during the year 19,850 specimens by gift, purchase or subsidy, and exchange. The vast majority of these, 16,599, represented the flora of Malaysia and Asia and 6056 of these were purchased by residual commitments. During the year the Arboretum sent out in continuation of exchange 23,460 specimens, of which nearly all went to herbaria and botanical gardens in Europe and Asia.

One of the major services which the Arboretum staff renders to the botanical and horticultural fields of research is the loaning of specimens from our herbarium. The large number of types and authentic specimens

in our herbarium indicates both the excellence of the collections and the activity of the staff members of the organization who have described new plants and placed in our herbarium the type specimen of the new unit. During the year the Arboretum received requests for the use of its material from forty-eight institutions in twelve different countries. Because of international or internal local disturbances and postal regulations, it was not possible to fill all of these requests. In total, eighty-seven loans were shipped out to forty-six institutions, half of them in the United States. The loans varied in size from single sheets to loans of 1498 and 1674 specimens. A total of over 14,000 specimens was sent out for the use and study of other students of plants.

The research activities of the herbarium staff were reduced again this year as the members devoted the majority of their time to work in the herbarium.

Dr. Howard worked on his collections of plants associated with bauxite soils from Jamaica and continued his studies of the genus *Coccoloba* in the West Indies. With the assistance of a technician, Miss Kathryn Greer, his research on the vascular structure of the petiole was expanded to include more tropical families and genera and involved some material from herbaria. Dr. Arthur Eames generously supplied for this study a large number of rare or unusual leaf forms, largely of the Proteaceae, from his collections of Australian plants.

Dr. Wood worked actively with the organization of a project on the flora of the Southeastern States. Along with Dr. Reed C. Rollins, director of the Gray Herbarium, he received support for this work through a three-year grant from the National Science Foundation. Surveys of bibliographies and indices are being made to classify recent literature references dealing with plants found in that area. Dr. Wood has continued his interest in the genera *Robinia* and *Drosera*, utilizing techniques of cytology and taxonomy in his study of each genus.

Dr. Channell, who has been working with Dr. Wood on the flora of the southeastern states, made a special study of the genus *Rynchospora*, as well as devoting a portion of his time to a completion of studies in progress of *Marshallia*.

Although much of his time is given to his regular work as editor of the Journal of the Arnold Arboretum and curator of the herbarium, Dr. Kobuski was able to devote a little time to the Theaceae, a family of his specialty.

Dr. Perry has accepted responsibilities for many phases of the work in the herbarium and was able to complete the preparation of labels for the collections made by L. J. Brass on the Fourth Archbold Expedition to New Guinea.

Mr. Canoso's work as curatorial assistant has been essential in the smooth functioning of the organization. During the year many collections have been received and accessioned. A major effort was the distribution of duplicate specimens on hand which had to be separated, packed and mailed.

The herbaria and the libraries have been used by the botanists working under the special grants for the Flora of China project. During the year Dr. Hu completed for publication a treatment of the Malvaceae and worked on an enumeration of the Compositae and the Orchidaceae of China. Dr. Liu worked on a monographic revision of the Pontederiaceae and the Stemonaceae for China and Dr. Hou completed revisions of the Palmae, Xyridaceae and Flagellariaceae for the same area.

Dr. Ivan Johnston continued his work on the Boraginaceae in Jamaica Plain and made one trip to Panama during the fall. During the spring semester Dr. Johnston was absent on sabbatical leave, dividing his time between Panama and the New York Botanical Garden.

Comparative Morphology:

Professor I. W. Bailey, Professor of Plant Anatomy *Emeritus*, has served voluntarily as the curator of the wood and pollen collection following his retirement. His efforts in arranging these collections and servicing requests for materials from the collections materially assisted the herbarium staff. Professor Bailey continues his anatomical studies and during the year completed several papers which will be published in the coming issues of the Journal of the Arnold Arboretum.

Several additions were made to the wood collection in the past year. The largest gift was a collection of wood samples from the forestry laboratory of British North Borneo. During the year Mr. Sherwin Carlquist, a National Science Foundation Fellow, studied the materials of the Compositae in the herbarium and the wood collection. Mr. Chen continued his interests in the anatomy of the Sapotaceae and utilized these collections and Dr. Abraham Fahn, visiting scholar from Hebrew University, Jerusalem, Israel, based his investigations on the Arnold Arboretum wood collections.

Cytogenetics:

Dr. Karl Sax, his assistants and students have reported the following contributions in the field of cytogenetics. It has been determined that the Sargent crab apple, *Malus sargentii* and its variety *rosea*, are facultatively apomictic. Some hybrids, however, have been obtained by crossing these plants with both ornamental and horticultural varieties of apple. The resulting hybrids are largely apomictic, suggesting that apomixis is a dominant character, at least in the hybrid swarms. If this is true, it should be possible to produce new varieties, both ornamental and economic in character, which can be reproduced from seed. Such work in selection continues.

Earlier interest in the species and varieties of lilacs has continued as crosses are made between *Syringa vulgaris* and *S. laciniata* and between *S. laciniata* and *S. pinnatifolia*. Both crosses have produced hybrids which are sterile. The sterility is apparently due to failure of the chromosomes to pair at meiosis. One possible method of overcoming this sterility barrier would be to increase the chromosome number and the production of arti-

ficial polyploids is being attempted with the use of colchicine. One induced tetraploid of *Syringa vulgaris* has been produced and has flowered, but so far has failed to set seed when crossed with other clones.

The use of bark inversions to alter the shape and flowering or fruiting characteristics of ornamental and economic trees remains a portion of the research interests of Dr. Sax. The antiquity of this field of research was the subject of an interesting article by Dr. Sax which appeared in the National Horticultural Magazine and was entitled, "What is New in Plant Propagation?" The technique of bark inversion has demonstrated that earlier flowering can be induced by inverting a ring of bark or by tying a knot in the stem of young plants of clonal vegetative propagated varieties. The techniques do not induce earlier flowering in seedlings and as yet no way has been found to shorten the juvenile stage of seedling trees.

Additional grants have been awarded to Dr. Sax by the Atomic Energy Commission to support research in basic investigations of chromosomal structure and behavior. A study of X-ray-induced chromosome aberrations financed by these grants has indicated that the chromosomes become bipartite a full generation before the daughter chromosomes divide. Dr. Sax has also worked in collaboration with the scientists and directors of the Gamma-radiation field at the Brookhaven National Laboratories. The ornamental plants from the Arnold Arboretum which have been grown in this radiation field have not shown as yet any recognizable mutations.

Instruction:

No regularly scheduled classes were offered by staff members during the year, although several took part in seminars and presented lectures for students in areas of their specialties. Two of Dr. Sax's former students completed their theses which were submitted and approved. On the basis of their work Dexter Sampson, now in the Department of Horticulture of the Ottawa Experimental Farm in Ottawa, Canada, and Gweneth Carson, currently a cytologist at the University of California, were awarded the degree of Doctor of Philosophy. Dr. Sax supervised the work of Mr. Claude Brown on bark regeneration and of Frank Santamour who is working on polyploidy in *Populus*. Mr. Tchang Bok Lee, a UNKRA fellow from Korea, continued his graduate work under the guidance of Dr. Howard and instigated during the spring work in hybridization of Korean and North American oaks in the Arboretum collection.

In the regularly scheduled seminars held at the Harvard University Herbarium, the Arboretum staff members contributed several programs. During the spring semester Dr. Wood talked about the "International Rules of Botanical Nomenclature" and was assisted by Dr. Perry; Dr. Howard spoke on the problems and practices of "Nomenclature of Cultivated Plants" and Dr. Kobuski and Dr. Hu reviewed the status of published and unpublished floras for the Eastern Hemisphere.

During the fall semester the seminar was devoted to a consideration of the vegetation of the southeastern states and the associated problems involved in a study of this area. Dr. Wood discussed the geology and geog-

raphy of the area, while Dr. Channell and Dr. Howard discussed two aspects of the vegetational relationships in the area. Dr. Hou also took part in this seminar series and reported on his work with *Celastrus* as an example of methods of study and vegetational relationships.

Travel and Exploration:

The Arboretum continued the policy of supporting its own staff members and other reliable collectors in field work and botanical exploration and collecting. A grant from the American Association for the Advancement of Science, through the American Academy of Arts and Sciences, enabled Dr. Wood to continue a study of the sundews in the Gaspé region of Canada and in northern Michigan. During the spring Dr. Wood collected additional woody materials for trial and study in the southeastern United States. Miss Kathryn Greer, assistant to Dr. Howard, collected morphological materials for anatomical studies in Cuba by means of special funds awarded to Dr. Howard by the American Philosophical Society. Dr. Howard made two short trips to Jamaica to further his study of the vegetation on bauxite soils and the replacement of vegetation on mined-out bauxite pits. During one trip he was able to join botanists from the Institute of Jamaica in an exploratory trip into the John Crow mountains at the eastern end of the island. This mountain range represents the largest and perhaps the most difficult unexplored area left in Jamaica. The goal of this exploration party was to locate a possible site for a base camp having reliable sources of water for further biological exploration of this important mountain chain. Such an area was located and it is hoped that the camp site can be developed for use by naturalists during the next few years.

Dr. Ivan Johnston made one collecting trip to Panama on contract with the U.S. Army Engineers during the fall and did extended work in the same area during a sabbatical leave of absence in the spring semester. His botanical collections from this rain forest will supplement those he made on San José Island of Panama during the war years.

During the spring the Fifth Archbold Expedition, under the direction of Mr. Leonard J. Brass, left for field work in New Guinea. The staff of the Arboretum, under Dr. Merrill's directorship, assumed full responsibility for the identification of the botanical materials from the second, third and fourth expeditions. However, since identifications for the botanical collections of the fourth expedition are not yet completed, the Arboretum agreed only to assist financially this fifth expedition in exchange for one of the early sets of materials.

Gifts and Grants:

The annual appeal to the Friends of the Arnold Arboretum was issued during the spring of the year and the generous gifts indicated the enthusiastic support of the public. The director and his staff are grateful for the gifts from the Friends which are unrestricted and used for horticultural work on the grounds and in our laboratories. During the past year

such gifts made possible a research assistant in the field of cytogenetics, additional help in the greenhouses for plant propagation and labor on the grounds to assist in cleaning and trimming along the paths and roads. Special gifts were also received from Friends for the support of collecting plant specimens and for the publication of writings by staff members.

Again during this year the largest single gift was received from the trustees of the China International Foundation for the support of work on the Flora of China carried on by Drs. Hu, Liu and Hou. Dr. Sax received additional grants from the Atomic Energy Commission for the support of his research and Dr. Howard received a grant from the American Philosophical Society to continue his investigations on the vascular structure of the petiole of higher plants. An additional non-departmental gift from Mr. George R. Cooley for taxonomic work at the joint discretion of Drs. Rollins and Howard was used to support field work and research on the vegetation of the southeastern United States.

We particularly appreciate the kindness of Mrs. Oakes Ames in giving permission to have reproduced her drawing of *Davidia involucrata*. Copies of this excellent print, suitable for framing, have been sent to the Friends of the Arnold Arboretum in acknowledgment of their gifts.

Gifts in kind were numerous and equally appreciated. Gift volumes for the library were received from several sources and included a fine set of Louden's Botanical Encyclopedia of 1854 in excellent bindings presented by Mrs. Frederic Goodwin. The Arboretum received many gifts of plant materials from organizations with which we regularly trade material and information and in addition received noteworthy gifts of material from individuals. Among these latter were cuttings of dogwood received from Miss Harriet R. Halloway, nine scions of tree peonies, originations of Dr. A. P. Saunders, from Miss Silvia Saunders and a group of seven rare evergreens from Mr. Robert E. More.

Publications:

Special attention should be directed to the publications of the staff which have appeared during the past year. Mrs. Susan D. McKelvey, research associate of the Arnold Arboretum and long a member of the Committee to Visit the Arnold Arboretum, completed the work on the proofs of her latest book and saw the first copy issued on March 26, 1956. The book is entitled "Botanical Exploration of the Trans-Mississippi West 1790–1850" and represents long and meticulous research in checking the routes and the botanical collections of the men of science who assisted in opening up the West. Mrs. McKelvey's book contains several excellent maps drawn by Dr. Erwin Raisz. It was published by the Arnold Arboretum and was printed by the Anthoensen Press of Portland, Maine.

Dr. Sax's book entitled "Standing Room Only" was published by the Beacon Press during the year and has been widely reviewed and discussed as a continuing contribution to demographic study.

In March the Macmillan Company issued Dr. Donald Wyman's latest book, "Ground Cover Plants." This book contains 175 pages, is profusely

illustrated and is unique as a record of experience in growing ground cover plants. Also during the year the revised edition of "Crab Apples for America" was published by the American Association of Botanical Gardens and Arboretums. Dr. Wyman was chairman of the committee which compiled the data and was responsible for its publication.

Three issues of the Journal of the Arnold Arboretum were published under the editorship of Dr. C. E. Kobuski. The fourth number of this magazine, which is normally a quarterly, was issued as a double number dedicated to Professor I. W. Bailey during the previous fiscal year. Twelve numbers of Arnoldia were published and issued as seven units, two of which were combined numbers. These were "Christmas Plants for the Boston Area" and the Arboretum's "Spring Planting Notes."

A sample treatment of the Malvaceae was issued on behalf of the Flora of China project. This monographic treatment of the family was written by Dr. Hu and printed by the Tudor Press. In 1953 Dr. Hu was awarded first prize in a Project Suggestion Contest sponsored by the Continental Development Foundation. The problems of preparing a flora of China was the subject of Dr. Hu's essay and the suggestion was considered by the committee to be worthy of further support. With grants from the China International Foundation, work was begun as proposed in the essay, using the library and herbarium resources of the Arnold Arboretum to compile in card catalogue form data on the occurrence, distribution and publication of vascular flowering plants of China. This card catalogue represents the most complete and up-to-date catalogue of vegetational records for the Asiatic mainland and will serve as the basis for future work in forestry, horticulture, floristics and agriculture. The catalogue is available for the use of all qualified visitors to the Arboretum and requests for information from other areas will be filled by photocopy or typescript at cost. To demonstrate the type of work which can be done using these cards and as a possible format for future publications towards a flora of China, Dr. Hu prepared the recently published treatment of the Malvaceae. It is hoped that other botanists will utilize the card resources made possible by the generosity of the trustees of the China International Foundation and that additional family treatments can be published as manuscript and funds are available.

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